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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **KANEKO, et al.**

Group Art Unit: **2871** #13 7-30-02

Serial No.: **09/269,503**

Examiner: **Timothy L. RUDE**

Filed: **March 29, 1999**

For. **LIQUID CRYSTAL DISPLAY DEVICE**

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REQUEST FOR RECONSIDERATION

Commissioner for Patents
Washington, D.C. 20231

July 18 2002

Sir:

In response to the Office Action dated **March 20, 2002**, extended to **July 20, 2002** by a **one** month Petition for Extension of Time, Applicants respectfully request reconsideration of all the following prior art rejections, as discussed below:

The Examiner has rejected claim 1 under 35 USC §103(a) as unpatentable over **Ouderkirk et al.**, in view of **Crawford et al.**, U.S. Patent 5,440,413 to Kikuchi, et al. (hereafter "**Kikuchi et al.**") and U.S. Patent 5,528,400 to Arakawa (hereafter "**Arakawa**").

Applicants respectfully traverse this rejection.

As noted in Applicants' previous response of January 9, 2002, **Ouderkirk et al.** discloses a transflector which increases efficiency and brightness under both ambient and supplemental lighting conditions in visual display applications. In one embodiment, the transflector includes a reflective polarizing element that reflects one polarization of light and transmits the other. In an alternate embodiment, the transflector includes a reflective polarizing element and a diffusing element such that the transflector diffusely reflects light of one polarization and transits the other.

The transflector is useful for both reflective and transflective liquid crystal displays.

Crawford et al. discloses a transmissive, backlit color twisted-nematic or super-twisted-nematic liquid crystal display employing a front fiber-optic faceplate or optical equivalent as a front retaining element of a liquid crystal cell that increases viewing angle between the display and a viewer while minimizing or eliminating undesirable variations in luminance, contrast ratio and chromaticity is described. The fiber-optic faceplate or optical equivalent includes cylindrical optical features and interstitial cladding material of greater optical index than the cylindrical optical features. The interstitial cladding material may include an opaque mask blocking layer to prevent the interstitial apertures from diffracting off-axis light into an observers's viewing cone. In particular, the liquid crystal display includes dual negative retarders, and a light shaping element such as a brightness enhancing film on the illumination source that increase the effective viewing angle between the display and viewer while minimizing undesirable variations in display chromaticity, luminance, and contrast ratio. The front fiber-optic faceplate or optical equivalent works in conjunction with the dual negative retarders and the light shaping element to provide an improved contrast ratio with a perfectly symmetric viewing angle and to eliminate grey scale inversions.

The Examiner has admitted that **Ouderkirk et al.** fails to disclose the use of a super twisted nematic liquid crystal or a retardation film having the relation nx>nz>ny, but has cited **Crawford et al.** for teaching such a relation. More particularly, the Examiner has noted that the relation nx>nz>ny is taught by the prior art cited in **Crawford et al.**, namely, **Kikuchi et al.** and **Arakawa et al.**

First, it should be urged that **Arakawa et al.** and **Kikuchi et al.** do not relate to a reflection-type polarizing film, and are therefore not combinable with the other cited references to teach the present invention.

Claim 1 of **Crawford et al.**, from which claim 4 depends, discloses a first negative retardation film interposed between the liquid crystal layer and the front polarizer (which film corresponds to the retardation film recited in claim 1 of the instant application) which has indices of refraction described by the equation $n_{z1}<n_{x1}=n_{y1}$, which does not meet the relation of nx>nz>ny, where nx is the refractive index in the direction of the phase delay axis, ny is the refractive index in the Y-axis direction, and nz is the refractive index in the thickness direction.

Thus, **Crawford et al.**, although disclosing the "nx>nz>ny" relation for the retardation film as prior art, teaches away from this relation in its invention disclosure, including claim 1.

The present invention solves problems which arise when an STN liquid crystal cell and a reflection-type polarizing film are combined, by providing a retardation film having relations nx > ny > nz or a twisted retardation film at an appropriate position, and thereby a favorable reflection display can be realized.

These functions and effects are not obvious from the combination of **Crawford et al.**, which discloses an STN liquid crystal cell and a retardation plate; or **Ouderkirk et al.**, which discloses a reflective polarizer.

Furthermore, FIGS. 9a, 9b and 10-12 of **Ouderkirk et al.** show a differing element 6 adjacent and outside of a reflective polarizer element 8.

This is in contrast to the present invention, in which a light diffusion layer is provided on the outside surface of an absorption-type polarizing film, as recited in claim 1 of the instant application.

Thus, the 35 USC §103(a) rejection should be withdrawn.

Claims 2, 4, 6, 14 and 16 stand rejected under 35 USC §103(a) as unpatentable over **Ouderkirk et al.** in view of **Crawford et al.** and further in view of **Bosma et al.**

Applicants respectfully traverse this rejection.

As noted in Applicants' last response, **Bosma et al.** discloses retardation layers based on a super-twisted nematic (STN) liquid crystalline layer. In the retardation layers, the liquid crystalline polymer is placed between glass substrates in which at least one substrate has a thickness of 20-500 micrometers. The use of such thin glass substrates reduces the weight and thickness of the retardation layer.

Bosma et al., like the other cited references, fails to teach, mention or suggest the relation nx>nz>ny for the retardation film or that a light diffusion layer is provided on the outside surface of an absorption-type polarizing film, as recited in claim 1 of the instant application, from which these claims depend.

Thus, the 35 USC §103(a) rejection should be withdrawn.

Claim 8 stands rejected under 35 USC §103(a) as unpatentable over **Ouderkirk et al.**, in view of **Crawford et al.** and **Bosma et al.**, and further in view of **Minowa et al.**

Applicants respectfully traverse this rejection.

As noted in Applicants' previous response, **Minowa et al.** discloses a display device and

decal for forming a display panel terminal. A thick film conductor is bonded onto the terminal portion of a transparent electrode of the display panel by a dry or wet transfer mounting method and a flexible printed circuit board for a driver is soldered on the thick film conductor.

Like the other cited references, **Minowa et al.** fails to teach, mention or suggest the limitations recited in claim 1, from which claim 8 depends.

Thus, the 35 USC §103(a) rejection should be withdrawn.

Claims 10 and 17 stand rejected under 35 USC §103(a) as unpatentable over **Ouderkirk et al.** in view of **Crawford et al.** and **Bosma et al.** and further in view of **Yang et al.**

Applicants respectfully traverse this rejection.

As noted in Applicants' last response, **Yang et al.** discloses a liquid crystalline light modulating cell and material having liquid crystalline light modulating material of liquid crystal and polymer, the liquid crystal being a chiral nematic liquid crystal having positive dielectric anisotropy and including chiral material in an amount effective to form focal conic and twisted planar textures, the polymer being distributed in phase separated domains in the liquid crystal cell in an amount that stabilizes the focal conic and twisted planar textures in the absence of a field and permits the liquid crystal to change textures upon the application of a field.

Like the other cited references, **Yang et al.** fails to teach, mention or suggest the limitations recited in claim 1, from which these claims depend.

Thus, the 35 USC §103(a) rejection should be withdrawn.

Claim 11 stands rejected under 35 USC §103(a) as unpatentable over **Ouderkirk et al.** in

view of **Crawford et al.** and further in view of **Ebihara et al.**

Applicants respectfully traverse this rejection.

As noted in Applicants' last response, **Ebihara et al.** discloses a reflection type liquid crystal display device including a pair of substrates having electrodes, a light scattering type liquid crystal layer interposed between the substrates, a reflection layer liquid crystal layer, and a light absorbing layer disposed over a rear surface of the reflection layer for absorbing a light passed through the reflection layer. The light scattering type liquid crystal layer changes into a scattering state or a transparent state in accordance with a change in a voltage level between the electrodes, and transmits 60% or more of incident light irrespective of the change in the voltage level between the electrodes. The reflection layer has a reflectivity within a range of 10 to 50% for reflecting a forward scattered light passed through the light scattering type liquid crystal layer.

Like the other cited references, **Ebihara et al.** fails to teach, mention or suggest the limitations of claim 1, from which claim 11 depends.

Thus, the 35 USC §103(a) rejection should be withdrawn.

Claims 12 and 18 stand rejected under 35 USC §103(a) as unpatentable over **Ouderkirk et al.** in view of **Crawford et al.** and **Bosma et al.** and further in view of **Ebihara et al.**

Applicants respectfully traverse this rejection.

As noted above, **Ebihara et al.** fails to teach, mention or suggest the limitations recited in claim 1, from which these claims depend.

In summary, the present invention utilizes each of the Z-type retardation film and the twisted

retardation film to liquid crystal display device, in combination with the reflection-type polarizing film.

In the present invention, as disclosed in page 7, line 24 to page 8, line 11 of the specification, a retardation film having the relation nx > ny > nz is used. Thus, the film serves as a birefringence layer, the viewing angle characteristic is improved, and the reflection-type liquid crystal display device becomes brighter.

It has been conventionally known to adopt the Z-type retardation film to the liquid crystal display device, but the adoption was for improving the contrast or viewing angle characteristic of colors, and not for enhancing brightness of display in a reflection-type liquid crystal display device. On the other hand, in the present invention, the Z-type retardation film is adopted in combination with the reflection-type polarizing film, and it makes it possible to utilize light in the surroundings more effectively than in the case where an uniaxial retardation film, which is another type of retardation film, is adopted, resulting in the extraordinary effect of brighter and better mirror display. A similar effect can be obtained also by adopting the "twisted retardation film", as recited in claim 2.

By providing the twisted retardation film into a liquid crystal display device wherein an STN liquid crystal cell and a reflection type polarizing film are combined, specific effects can be realized. The effects are described from page 20, line 14 to page 21, line 20 of the specification.

If the twisted retardation film 14 is not provided, there occurs a problem that the light linearly polarized in the direction parallel to the transmission axis 8a which is incident from the absorption-type polarizing film 8 assumes an elliptically polarized state after passing through the STN liquid

crystal cell 17. It is therefore unnecessarily colored by the reflection-type polarizing film 10 or cannot pass through as a completely linearly polarized light.

However, by disposing a twisted retardation film in front of the STN liquid crystal cell, the incident linearly polarized light assumes an elliptically polarized state, and returns to "a substantially completely linearly polarized light" when passing through the STN liquid crystal cell. When the substantially completely linearly polarized light falls on the reflection-type polarizing film, "the whole incident light is reflected by the reflection-type polarizing film 10, which appears as a metallic silver background".

That is, the twisted retardation film compensates a polarization state of the incident light to render the incident light to fall on the reflection-type polarizing film not in a state elliptically polarized but in a state substantially completely linearly polarized, thereby realizing a favorable reflection state.

As described above, the present invention solves problems which arise when an STN liquid crystal cell and a reflection-type polarizing film are combined, by providing a retardation film having relations $nx > ny > nz$ or a twisted retardation film at an appropriate position, and thereby a favorable reflection display can be realized.

None of the cited references, above or in combination, teaches, mentions or suggests these features of the present invention.

In view of the remarks above, the 35 USC §103(a) rejection should be reconsidered and withdrawn.

If, for any reason, it is felt that this application is not now in condition for allowance, the

Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully Submitted,

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